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TRANSACTIONS

OF

THE NORTH OF ENGLAND INSTITUTE

OF

MINING AND MECHANICAL ENGINEERS.

II.—SUBJECT-MATTER INDEX.

VOLS. I. TO XXXVIII.—1852 TO 1889.*

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s, List of Mines Worked.
s, Reports of H.M. Inspectors.
s and Minerals, Scranton.
ng Association and Institute of Cornwall.
ng Engineering.
ng Institute of Scotland
ng Journal.
ng Society of Nova Scotia.
ral History Society of Northumberland and Durham.
rforschende Gesellschaft zu Freiburg im Breisgau.
s Jahrbuch für Mineralogie, Geologie, und Paleontologie.
castle Daily Journal.
castle-upon-Tyne Union Statement of Accounts.
South Wales Geological Survey Branch, Department of Mines. Reports.
York Academy of Sciences.
Zealand Institute.
Zealand Institute of Mining Engineers.
Zealand Mines Department. Reports.
rke (Den) Ingenior- og Arkitekt-Forening og Den Polyteknisk Forening.
rth-East Coast Institution of Engineers and Shipbuilders.
rth Staffordshire Institute of Mining and Mechanical Engineers.
va Scotia Department of Mines. Reports.
va Scotian Institute of Science.
rhessischen Gesellschaft für Natur-und Heilkunde, Giessen.
terreichische Zeitshcrift für Berg- und Hüttenwesen.
cial Year Book of Scientific and Learned Societies.
io Mechanics Institute.
tario Bureau of Mines, Reports.
tent Office, London.
tent Office, Melbourne, Victoria.
nsylvania State College Mining Bulletin.
losophical Society of Glasgow.
ctical Engineer.
Comitato Geologico d' Italia, Roma.
vista Minera Metalúrgica.
vue de la Législation des Mines.
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chester Academy of Science.
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Smithsonian Institution, Washington, U.S.
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Société des Ingénieurs sortis de l'Ecole Provinciale d'Industrie et des Mines du Hainaut.
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Society of Chemical Industry.
Society of Engineers.
South African Association of Engineers and Architects.
South African Republic, Reports of State Mining Engineer.
South Staffordshire Institute of Iron and Steel Works Managers.
South Wales Institute of Engineers.
Stahl und Eisen.
Steamship.
Steven's Indicator.
Times Newspaper, London.
Times Newspaper, Index.
Trade and Navigation Accounts.
U.S. Naval Institute, Annapolis.
U.S. Patent Office, Washington.
Vereins Mittheilungen, Beilage zur Oesterreichischen Zeitschrift.
Victoria Department of Mines. Reports.
Victorian Institute of Surveyors.
Western Australia, Department of Mines.
Western Society of Engineers.
West of Scotland Iron and Steel Institute.
Wisconsin Academy of Sciences, Arts, & Letters.
Work.
Zeitschrift des Vereines Deutscher Ingenieure.
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